CLAIMS

What is claimed is:

Claim 1. A method of measuring the phase of a pseudorandom (PN) sequence of chips, each chip having a polarity that is either positive or negative, and having a time duration, T_{chip}, the method comprising:

generating a reference model exhibiting a reference phase, said reference phase adjustable to facilitate alignment with said phase of said pseudorandom sequence;

establishing a plurality of pulsed-windows over which a plurality of samples of said pseudorandom sequence are collected for a selected accumulation interval;

accumulating said plurality of samples for each pulsed window of said plurality of pulsed windows to form a plurality of accumulated sums;

compensating each accumulated sum to form at least one compensated sum, if a number of level transitions and non-transitions of said pseudorandom sequence is not equal; and

combining said compensated sum to determine a phase error from said plurality of compensated sums, said phase error corresponding to a phase difference between said reference phase and said phase of said pseudorandom sequence.

Claim 2. The method of Claim 1 further including normalizing said phase error by dividing at least one of said compensated sums of said plurality of compensated sums, by a second summation taken only over pulsed windows that are based on a number of polarity transitions of the pseudorandom sequence.

Claim 3. The method of Claim 1 wherein said plurality of pulsed windows is configured so that a misalignment of less than a selected width, between said reference phase and said phase of said pseudorandom sequence, results in said phase error

exhibiting a first polarity when said reference phase lags said pseudorandom sequence phase and a opposite polarity when said reference phase leads said pseudorandom sequence phase.

Claim 4. The method of Claim 1 wherein said selected width is $w_1/2$, and w_1 is a selected width of an A_1 pulsed window.

Claim 5. The method of Claim 1 wherein said at least one pulsed window is configured so that if said reference phase leads said phase of said pseudorandom sequence by more than a selected width but less than one chip width, said phase error is zero.

Claim 6. The method of Claim 1 wherein said phase error is larger than any value of said phase error that occurs when said reference phase leads pseudorandom sequence phase, if said reference phase lags pseudorandom sequence phase by more than a selected width, but less than one chip width.

Claim 7. The method of Claim 1 wherein said compensating includes scheduling a contribution to said combining for each pulsed window of said at said plurality of pulsed windows based on a number of level transitions and a number of non-transitions of said pseudorandom sequence

Claim 8. The method of Claim 1 wherein said phase error is proportional to a true phase error provided said phase error is less than a selected width.

Claim 9. The method of Claim 1 wherein said compensating includes scheduling each respective contribution to said, based on a count *Nt* corresponding to a number of transitions of said pseudorandom sequence within a selected accumulation interval and a count *Nn* corresponding to a number of non-transitions of said pseudorandom sequence within said accumulation interval.

Claim 10. The method of Claim 7 wherein *Nt* is equal to a number of transitions of said pseudorandom sequence within said accumulation interval and *Nn* is equal to a number of non-transitions of said pseudorandom sequence within said accumulation interval

Claim 11. The method of either Claim 7 wherein said count *Nt* is further subdivided into a count N_{HL} and a count N_{LH}, where N_{HL} is proportional to a number of high-low (HL) transitions of said pseudorandom sequence within said accumulation interval and N_{LH} is proportional to a number of low-high (LH) transitions of said pseudorandom sequence within said accumulation interval and wherein said count N_{HL} and said count N_{LH} provide compensation for any inequality between HL transitions and LH transitions of said pseudorandom sequence.

Claim 12. The method of Claim 9 wherein N_{HL} is equal to said number of HL transitions of said pseudorandom code within said accumulation interval, N_{LH} is equal to said number of LH transitions of said pseudorandom sequence within said accumulation interval, and *Nn* is equal to said number of non-transitions of said pseudorandom sequence within said accumulation interval.

Claim 13. The method of Claim 1 wherein said pseudorandom sequence is broadcast from any satellite.

Claim 14. The method of Claim 1 wherein said pseudorandom sequence is broadcast from a GPS satellite

Claim 15. The method of Claim 1 wherein said plurality of pulsed-windows exhibit variable widths.

Claim 16. The method of Claim 1 wherein said plurality of pulsed-windows exhibit variable heights.

Claim 17. The method of Claim 1 wherein said plurality of pulsed-windows are rectangular.

Claim 18. A method of measuring the phase of a pseudorandom (PN) sequence of chips, each chip having a polarity that is either positive or negative, and having a time duration, T_{chip}, the method comprising:

generating a reference model exhibiting a reference phase, said reference phase adjustable to facilitate alignment with said phase of said pseudorandom sequence;

establishing a pulsed-window over which a plurality of samples of said pseudorandom sequence are collected for a selected accumulation interval;

accumulating said plurality of samples for each pulsed-window to form at least one accumulated sum;

combining said at least one accumulated sum to determine a phase error, said phase error corresponding to a phase difference between said reference phase and said phase of said pseudorandom sequence; and

normalizing said phase error by dividing said at least one accumulated sum, by a second summation taken only over pulsed windows that are based on a number of polarity transitions of said pseudorandom sequence.

Claim 19. The method of Claim 18 wherein said normalizing further includes multiplying by a selected value that is proportional to a width of a window over which said second summation is taken.

Claim 20. A system for measuring the phase of a pseudorandom (PN) sequence of chips, each chip having a polarity that is either positive or negative, and having a time duration, T_{chip}, the system comprising:

a means for generating a reference model exhibiting a reference phase, said reference phase adjustable to facilitate alignment with said phase of said pseudorandom sequence;

a means for establishing a plurality of pulsed-windows over which a plurality of samples of said pseudorandom sequence are collected for a selected accumulation interval;

a means for accumulating said plurality of samples for each pulsed window of said plurality of pulsed windows to form a plurality of accumulated sums;

compensating each accumulated sum to form at least one compensated sum, if a number of level transitions and non-transitions of said pseudorandom sequence is not equal; and

a means for combining said compensated sum to determine a phase error from said plurality of compensated sums, said phase error corresponding to a phase difference between said reference phase and said phase of said pseudorandom sequence.

Claim 21. The system of Claim 20 further including a means for normalizing said phase error by dividing at least one of said compensated sums of said plurality of compensated sums, by a second summation taken only over pulsed windows that are based on a number of polarity transitions of the pseudorandom sequence.

Claim 22. A storage medium encoded with a machine-readable computer program code for measuring the phase of a pseudorandom (PN) sequence of chips, each chip having a polarity that is either positive or negative, and having a time duration, T_{chip}, said storage medium including instructions for causing controller to implement a method comprising:

generating a reference model exhibiting a reference phase, said reference phase adjustable to facilitate alignment with said phase of said pseudorandom sequence;

establishing a plurality of pulsed-windows over which a plurality of samples of said pseudorandom sequence are collected for a selected accumulation interval;

accumulating said plurality of samples for each pulsed window of said plurality of pulsed windows to form a plurality of accumulated sums;

compensating each accumulated sum to form at least one compensated sum, if a number of level transitions and non-transitions of said pseudorandom sequence is not equal; and

combining said compensated sum to determine a phase error from said plurality of compensated sums, said phase error corresponding to a phase difference between said reference phase and said phase of said pseudorandom sequence.

Claim 23. A computer data signal embodied in a carrier wave for measuring the phase of a pseudorandom (PN) sequence of chips, each chip having a polarity that is either positive or negative, and having a time duration, T_{chip}, said data signal comprising code configured to cause a controller to implement a method comprising:

generating a reference model exhibiting a reference phase, said reference phase adjustable to facilitate alignment with said phase of said pseudorandom sequence;

establishing a plurality of pulsed-windows over which a plurality of samples of said pseudorandom sequence are collected for a selected accumulation interval;

accumulating said plurality of samples for each pulsed window of said plurality of pulsed windows to form a plurality of accumulated sums;

compensating each accumulated sum to form at least one compensated sum, if a number of level transitions and non-transitions of said pseudorandom sequence is not equal; and

combining said compensated sum to determine a phase error from said plurality of compensated sums, said phase error corresponding to a phase difference between said reference phase and said phase of said pseudorandom sequence.